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SCIENCE NEWS-LETTER

The Weekly Summary of Current Science

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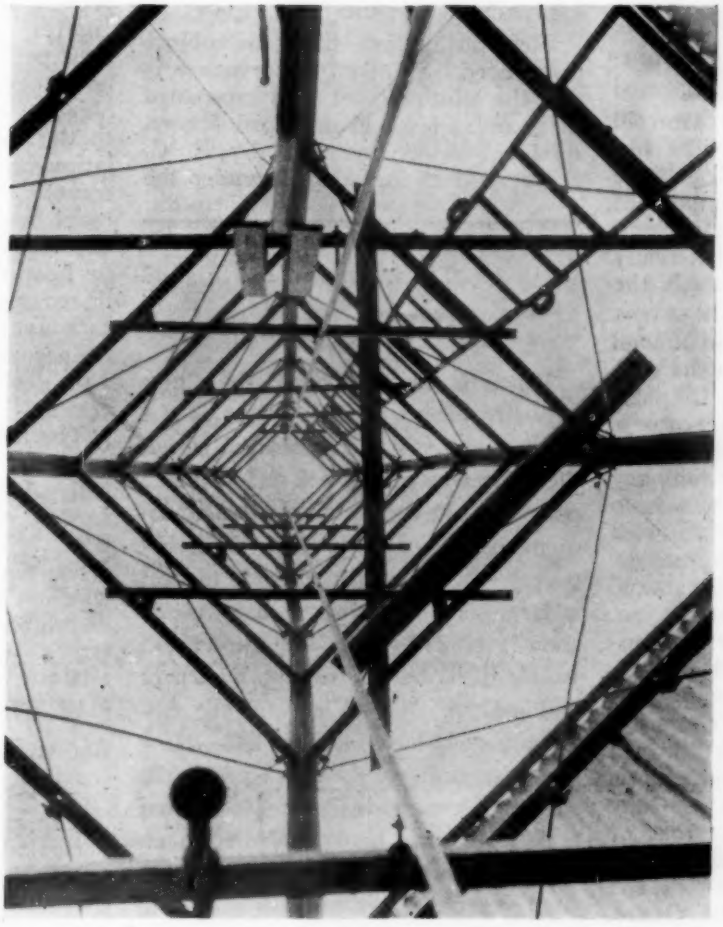

PATH TO THE SKIES

Looking Up the Goddard Rocket Tower

(See page 243)

Vol. XVII No. 471

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Planet Possibly Not Object Predicted

Astronomy

THE new member of the solar system discovered beyond Neptune may not be the ninth major planet predicted by the late Prof. Percival Lowell. Doubt was cast upon its planetary nature by computations made at the Lowell Observatory, where the remarkable solar system outpost was discovered.

Over a month ago the discovery of a faint heavenly object that seemed to conform to the expected orbit of the ninth planet thrilled the world. Now it seems possible that astronomers may eventually concede that the Lowell Observatory astronomers discovered not the expected major planet but a unique asteroid or an extraordinary comet-like object. Such a discovery will still be rated as one of the most important in the history of astronomy, perhaps even more important than if it really had been the planet for which the search was being made.

That "planet X" is not the Lowell planet is to be inferred from the data announced by Dr. V. M. Slipher, director of the Lowell Observatory. He did not discuss the implications of the values of the "preliminary orbit of planet X which has been computed by the Lowell staff with the aid of Dr. John A. Miller, director of the Sproul Observatory" using positions of the object on Jan. 23, two days after it was first photographed, Feb. 23 and March 23.

The Lowell orbit computations give the eccentricity as 0.909, meaning that the object sweeps through space in a greatly elongated ellipse, far flatter than the orbit of any known planet and more like that of a comet. The object's path is far more inclined to the plane of the earth's orbit than any major planet, the calculated inclination being seventeen degrees twenty-one minutes.

Dr. Slipher reports that the distance of the object from the sun is forty-one and three-tenths times that of the earth, far more distant than any known body in the solar system. This is approximately the distance of the planet Lowell predicted. Even more startling is Dr. Slipher's report that the greatest diameter of the object's orbit is such that it sweeps out into space forty billion miles from its position closest to the sun. This is far greater than any distance hitherto measured within the solar system. The object has just begun to recede from its closest approach to the sun.

First intimation that the object discovered by Lowell Observatory is not the ninth planet was contained in an announcement on April 5 of a series of orbits computed by E. C. Bower and F. L. Whipple under the direction of Prof. A. O. Leuschner of the University of California.

Informed of the Lowell computations, Prof. Leuschner and Dr. Harlow Shapley, director of the Harvard College Observatory, issued the following statements to Science Service:

Possibly Asteroid

By Prof. Armin O. Leuschner

The Lowell result confirms the possible high eccentricity announced by us on April 5. Among the possibilities are a large asteroid greatly disturbed in its orbit by close approach to a major planet such as Jupiter. Or it may be one of many long period planetary objects yet to be discovered, or a bright cometary object. I have frequently referred to the close orbital and physical relationship of minor planets and comets. High eccentricity and small mass would seem to eliminate the object as being planet X predicted by Lowell, and signify an unexpected discovery, nevertheless of highest astronomical importance and interest on account of the great distance of an object in the solar system at discovery.

The Lowell orbit agrees closely with our orbit V, but our limited material still admits other solutions. If the Lowell orbit, and our orbit V, are near the truth, the object is receding from the sun in its course towards aphelion and will gradually diminish in brightness beyond the power of the largest telescopes. Only with a very accurate orbit could it be recovered after several centuries.

More Important Than Planet

By Dr. Harlow Shapley

The preliminary orbit indicates a remarkable type of member of the solar system not comparable with known asteroids and comets and perhaps of greater importance in cosmogony than would be another major planet beyond Neptune.

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The Answer Is

In This Issue

What is the shape of the *"new planet's"* orbit? p. 242—What is the greatest *distance* ever measured within the solar system? p. 242—How much power would the complete *breakdown* of matter liberate? p. 243—What discovery would make it *possible* to heat a large building with a handful of snow? p. 243—Why did the ancient *people* of Palestine worship a serpent goddess? p. 244—What did the *Canaanite* gods look like? p. 244—How does the motorman's *health* affect the safety of passengers? p. 246—What makes accurate *photography* from an airplane difficult? p. 247—What has been suggested as a possible *substitute* for cod liver oil? p. 248—Can *bees* tell time? p. 249—What has been the *effect* of diet on girls' stature? p. 250.

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Travel to the Moon by the Year 2050

Astronautics

Princeton Astronomer Predicts Space Travel Surprisingly Soon

BY the year 2050, earth-dwellers will probably be able to travel to the moon, and to communicate with their terrestrial home by telephoning over a beam of light. They will get there by travelling in a rocket ship at a speed of some 50,000 miles an hour, but far sooner, probably 1950, it is likely that a speed of 1000 miles an hour will be possible.

This was the prediction made by Dr. John Q. Stewart, associate professor of astronomical physics at Princeton University and co-author of a leading astronomical text-book.

Speaking before the Brooklyn Institute of Arts and Sciences, Dr. Stewart made what he called an "educated guess" about the future of rocket travel through interplanetary space.

"The speed of a rocket-propelled space-navigating cruiser will presumably be of the order of 25,000 miles per hour," declared Dr. Stewart. "This is the speed at which, neglecting air resistance, a projectile would have to be fired upward in order to travel to a height indefinitely great.

"Study of the increase in speeds of passenger-carrying vehicles during the past century leads to a guess at the date when such a speed will be realized. The year 2050 is the indicated date. That is surprisingly soon.

"During the past hundred years, the maximum vehicular speed has increased every year, on the average, by about 2 per cent. It has been compounded at 2 per cent. per annum. In earlier times the increase was very slow. It may be that in the future the rate of increase will again be slow. The indications are, however, that it will be even more rapid. Assuming that speeds will be compounded during the next century at 3 per cent. per annum, a speed of 1000 miles per hour will be reached in 1950, and vehicular speeds above 50,000 miles per hour will be available by the year 2030."

At present, he stated, the best efficiency that can be obtained with any fuel is about one kilowatt-hour for every pound, but this will need to be greatly increased to make possible the navigation of space. In the laboratory, however, very minute amounts of much more efficient stores of energy have been obtained—one is ionized hydrogen, which would yield about a hundred times as much energy as the same amount of coal and oxygen. But no way is known of obtaining such materials in large enough quantities.

In a lonely corner of Camp Devens, Mass., Dr. Robert H. Goddard, Professor of Physics at Clark University, Worcester, Mass., is preparing for actual flights with rockets that he hopes to send up to high altitudes. Our cover picture shows a view up inside the steel tower through which the rocket will pass in the start of its epoch-marking trip. Such experiments are bringing closer the day described by Dr. Stewart in the article below, when men may actually be able to travel to the moon and other members of the solar system.

Another possibility would be that energy might be supplied to the rocket ship by radio, but he held out the hope of a super-efficient fuel.

"Astrophysicists who study the source of solar and stellar energy speculate about the possibilities of a more efficacious process still—the complete breakdown of matter into energy," he said. "This process, it is supposed, would liberate 1,300,000 kilowatt years per pound—about ten billion times as much as coal and oxygen. Such breakdown of matter may be going on deep within the sun, supplying the huge power which the sun has been radiating for a billion years or more.

"Amazing practical results will follow if this 'constitutional energy' of matter ever is released by engineers.

"The constitutional energy of a bucket of sea-water would be sufficient to drive for more than a month the engines of the merchant fleet of the world."

"The constitutional energy of a breath of air would operate a powerful airplane for a year, continuously.

"The constitutional energy of a handful of snow would heat a large apartment house for a century.

"The constitutional energy of the pasteboard in a small railroad ticket would run a heavy passenger train several times around the globe."

Describing the possible vehicle for such a flight, Dr. Stewart asked his audience to "imagine a 'ship' built in the form of a large metal sphere—say 110 feet in diameter with a total initial mass of 70,000 metric tons. A dozen or more cannon protrude slightly from the spherical surface of the hull, symmetrically arranged at various points. When a given one of these cannon is fired, the reaction drives the ship in the opposite direction.

"The material is supposed shot out at a speed of 300 kilometers, or nearly 200 miles, a second. In order for the ship to reach the moon and return again, 28,000 tons (of the whole initial mass of 70,000 tons) of stuff should be carried in the bunkers to be shot from the guns. Suppose for definiteness that the material is lead, and is fired in the form of powder.

"The vessel must be completely air-tight and provided with heating and cooling devices, and with all the necessities of life, including air and water, for a two months' cruise. A crew of about 60 men seems reasonable, with a passenger list of a dozen scientists.

"Because of the enormous power developed, the start would be made from a desert . . . The impact of the shot would tear and burn a great hole in the desert.

"The start would be made half an hour or so before noon, and about three days before new moon. The ship would be headed for the sun. She would rise perhaps 12 miles in the first six minutes and would soar roaring out of the atmosphere at 200 miles per hour."

Once at the moon, Dr. Stewart thinks that communication by telephone with the earth might be carried on over a beam of light, as the Kennelly-Heaviside layer might make radio impossible. To return, the ship would take off in the same way that she left the earth, coasting most of the way, because of the earth's greater gravitational attraction. But care would have to be taken in landing, for if the ship came down too fast over a city, and the rockets were fired to check the fall, it would be disastrous to the people below.

Found— "Graven Images" of a Bible City in Palestine

Archæology

Astarte, the Venus of the Land of Canaan. In her name vicious rites were celebrated, much to the wrath of Israelite prophets. A figurine from Beth-Shan.

By Emily Davis

A SERPENT goddess has been dug out of the ruins of a Biblical city in Palestine. She is not like the gracefully curved marble goddesses of Greece. She stands in low relief against a flat plaque of rough limestone. Her bare feet are planted in a sidewise pose reminiscent of Egypt. Her robe falls stiffly to her ankles. And about her body coils a great snake, symbol of power, wisdom, immortality. The head of the goddess is broken, vanished. So too are the arms, which perhaps held outstretched the upper portion of the serpent's body.

Broken and marred by fire as the figure is, it is an object of rare interest, for it proves that the Canaanites of Bible history worshipped a serpent goddess. At other Canaanite cities lately excavated there have appeared altars and other clues to a serpent cult.

Here, now, is the goddess herself, revealed as one of the idols of stone supreme in the Land of Canaan before the children of Israel came to conquer their "Promised Land." It was against the wiles of such deities as this that leaders and prophets of Israel recurrently cried their warnings.

The serpent goddess is a recent discovery from the ruins of Kirjath-Sepher, a Canaanite royal city, now being excavated by the joint efforts of the American School of Oriental Research in Jerusalem, and the Xenia Theological Seminary of St. Louis. Dr. W. F. Albright is director of the excavations.

The serpent goddess is one of the tangible bits of Canaanite property that makes us realize that the enemies of the children of Israel were "people." When we read the Old Testament battle stories, we feel the reality of Joshua and his associate leader Caleb. The children of Israel are real enough with their waverings, their complaints, their ups and downs of faith. But the Canaanites, who were original holders of the Promised Land, loom in the background of the story as shadowy foes.

More than 3,000 years after the battles in the Promised Land, archaeologists are filling in the Bible picture by digging up the material evidence from mounds that represent the ancient strongholds. Kirjath-Sepher is proving particularly enlightening. This town figures in the Book of Joshua where it is written: "And Caleb said, He that smiteth Kirjath-Sepher, and taketh it, to him will I give Achsah my daughter to wife."

In response to this challenge, Caleb's nephew Othniel attacked and took the stronghold and won the hand of his cousin. But as to what happened to the Canaanites, who were driven from their hill by flames, the Biblical story says nothing.

Archæologists who dug into the hill expected primarily to find a library there, for Kirjath-Sepher means the Book City. The literary name is still a mystery.

Dr. Albright's excavations have shown that the mound contains the ruins of six settlements. Three of those ancient towns were swept by fire. Repeated destruction and replacement of walls and houses is what might be expected, in view of the fact that Palestine has always been a no-man's land of shifting battle lines and conquests. The strip of country desired by the Israelites was a tramped-over, fought-over highway between Egypt on the south and Assyria and Babylonia to the north and around the desert to the east.

When one of the "fenced cities" that dotted this embattled highway was razed by flame, the survivors or the conquerors generally salvaged the tumbled-down bricks and building stones and set another city on the same hill, leaving the bits of pottery, the broken weapons, the religious figurines, and the ruins of buildings, all beneath their feet.

This practice of setting one town on the ruins of the last is a great help to archaeologists. They are able to gauge the antiquity of successive towns by the depth of the buried objects, as well as by the differences in household pottery, and by the presence of bronze or iron in the different layers.

The first people who chose the steep hilltop of Kirjath-Sepher to be a lookout and refuge, came there near 2000 B. C. Few traces of their existence, except for their clay pots and pans, have been found in the deeply buried

layer that represents their community. They were early Bronze Age men and women, who no doubt made their homes in the form of wooden huts, and set up a palisade of tree trunks and earth.

The first settlement was followed by a series of cities with solid stone walls. And so we return to the serpent goddess, for it was in the third of the cities, dating from about 1700 B. C. that the unique figure was found, lying in the ruins of a building, apparently a palace.

Why was the serpent a holy creature to the Canaanites? Does the worship of an animal seem strange and incredible to you? Dr. George S. Duncan, professor of Egyptology at the American University, and author of a recent book on Biblical archaeology, points out that the serpent inspired awe in human beings very early in the history of civilization. Primitive men could recognize that some animals had strength, speed, and other abilities far beyond the physical limitations of man. And to primitive thinkers those abilities argued for superior powers hidden in animal forms.

"So," Dr. Duncan explains, "very likely, some primitive naturalists noted that the serpent sheds its skin. This suggested that the snake could go on living indefinitely, renewing its youth at will. If it had such power, it was indeed to be venerated.

"Crete had its serpent cult and its priestesses who carried snakes coiled about them, like the goddess of Kirjath-Sepher. Egypt, too, venerated the snake among other animals supposed to possess special powers."

The unique but badly damaged carving of the Serpent Goddess of the Canaanites, found at Kirjath-Sepher. At first archaeologists thought that the serpent was coiled around a sacred tree, but on cleaning the stone, they could see the feet of the goddess, planted sideways, and her long skirt and the serpent coiling round the body up to the waist. The head of the goddess is missing. The dotted lines indicate how the complete figure may have looked.

The Israelites who were held captive in Egypt knew all about all these animal deities, Dr. Duncan continues. And Moses, who was brought up at the court of Pharaoh, perhaps knew more. When the Israelites were bitten by serpents in the wilderness, Moses drew on an Egyptian belief, half religious, half medical, which was that the bite of the serpent could be healed by looking up to it and asking for its favor. The serpent, it was argued, would attack because it was offended. It must be propitiated. Thus, Moses used a serpent of brass as a psychiatric treatment to calm the emotional and mental panic of his distressed followers.

This brazen serpent continued to play a leading role in Israelite affairs. The Bible record says no more about it until we find King Hezekiah going into the temple and smashing the image. The brief phrasing of this dramatic episode is that Hezekiah "brake in pieces the brazen serpent that Moses had made; for unto those days the children of Israel did burn incense to it."

Now that we know that the serpent was an established deity in the land of Canaan, we can better understand why that brazen serpent of the wilderness gained in mystic importance when the Israelites brought it into Canaan. King Hezekiah's wrathful destruction of the image was no hasty outburst against a statue that had become a little too much venerated as a historic relic. He was conducting a reformer's whirlwind campaign against a deep-rooted powerful cult.

In the town level of Kirjath-Sepher just above the layer that contained the serpent goddess, the archaeologists have found five figurines of another, better known Canaanite divinity, Astarte. The Israelites derisively called her Ashtoreth, from a word meaning shame. This goddess was worshipped by almost every nation of antiquity in some form or another. She was the goddess of love and of fertility. Whether you called her Venus, Aphrodite, Astarte, Ishtar, Tanit, Kadesh, or what not, depended upon the land you chanced to live in. The Canaanites kept little figurines of her as a naked maiden, with spiral curls framing her face, and with long-stemmed flowers in her hands. Her likeness with variations of detail has been unearthed in various cities of Palestine where archaeologists have been digging.

The rites of Astarte were an alternate horror and allurement to the Israelites, whose invisible Jehovah abominated such (*Turn to page* 254)

The artist called this old engraving "Gideon destroying the altar of Baal." But recent excavations show that the gods of the Land of Canaan were not like Greek statues. Nor did Gideon wear a Roman soldier's uniform.

Ant Gestures Have Chemical Cause

Animal Psychology

Communication System Not "Antennal Language"

WHEN two ants meet and tell each other all about it, with excited gesturing and touching of forelegs and antennae, they are not talking in some precocious sign language. Their system of communication, which has puzzled and attracted psychologists, is traced to a chemical cause by T. C. Schneirla, of New York University.

Speaking before the New York Chapter of the American Psychological Association, he explained that he linked up ants' nests and tubes so that one ant would be released into a chamber containing honey or meat or else containing some ants of an enemy tribe. When the ant returned from his pleasant encounter with food or from a less pleasant adventure into enemy country, he was brought face to face with an ant of his own community.

From the behavior of the two ants on these occasions, Mr. Schneirla concluded that chemical substances given off from food or from other ants cling to the body of an ant. When the ant meets a friend, they gesture and touch and the second ant senses the chemical substances. The more powerful and exciting the situation that has occurred, the more rapid are the motions of the communicating ants. But no differences could be detected in the timing or the sort of gestures, used in communicating good news or bad. Hence, Mr. Schneirla found no evidence to support the theory that ants have an "antennal language."

In other tests, he found no evidence that an ant which had returned to the nest after a great food discovery gave the other ants any reliable directions as to where to go, though the ants in the nest became excited on the scout's return and set out hastily toward the place where they were accustomed to be fed.

Science News-Letter, April 19, 1930

Health and Safety

THE happy, healthy motorman is more likely to keep his street car out of traffic accidents than is the man who is physically ill or who runs his car while balancing a chip on his shoulder.

How medical and psychological examinations have been given to motormen with good and bad traffic records to test this point was reported by Dr. O. M. Hall, of the Personnel Research Federation.

Among the men who had high accident records, 39 per cent. were found to have personality defects, the psychologist reported. That is, these men did not get along smoothly with other people. Among the men with superior records for keeping out of trouble only five per cent. were found to be "un-cooperative."

Forty-nine per cent. of the high-accident motormen were found to have health defects, chiefly abnormal blood pressure and hernia. This was contrasted with only nine per cent. of the low-accident motormen having such health defects.

Aptitude for the work of running a car was also tested, and it was found that 40 per cent. of the drivers who ran into trouble made poor records on this test, whereas only 12 per cent. of the safe drivers showed lack of aptitude for the job.

Science News-Letter, April 19, 1930

Understanding People

THE active, social individual, who does not bother his head much with heavy thinking, is better at understanding the behavior of his neighbors than is the quiet thinker. This paradoxical sounding suggestion was advanced by Dr. Herbert S. Langfeld, of Princeton University.

Human beings are able to understand more or less what is going on in the minds and the emotions of other people by observing their gestures, facial expressions, and other clues in their behavior, Dr. Langfeld explained. In our efforts to interpret behavior foreign to our own personal experience we are aided by the fact that gestures and facial expressions have become conventionalized. We know how to interpret the raising of an eyebrow. We do not need to think deeply into human motives and mental processes to understand the other person's point of view when he gives standardized clues. People who are of the social minded or extrovert type of personality become adept at reading the shorthand language of behavior, Dr. Langfeld showed.

Science News-Letter, April 19, 1930

For Those Over 40

THE "unplumbed resources of the man and woman over forty"—a growing problem of industry and a growing personal problem throughout American homes—were brought strongly to the attention of psychologists as a field where their services are urgently needed, in an address by Dr. Lorine Pruette, of New York.

Education is constantly lengthening the period of preparation before turning the boy and girl into productive work, and, at the same time, industry is tending to discard workers at a lower age limit, Dr. Pruette pointed out.

"It becomes more and more a question whether we can, in the short productive period of maturity, do enough to provide for the long stretches of non-productive existence," it was stated.

There should be a psychologist employed in every business organization of any size, Dr. Pruette continued, and he should be doing a great deal more than discriminating between salesclerks and typists. The worker who is considered by employers as "too old" is often senescent in his attitude rather than in his glands.

"The sense of being at a dead-end, of growing futility of effort, and a frightened conviction of being without value is apt to come to every worker at some time," the speaker stated. "As we grow older, we are more liable to disappointments, while our capacity to reconstruct our interests declines."

Cats' Hearing

A CAT can hear tones far higher in pitch than any mouse's squeak or any coloratura singing of back fence feline serenades. In fact, a cat's ability to detect high tones is just about as great as that of human beings, Dr. Ernest G. Wever, of Princeton University, told the meeting.

Dr. Wever has settled this point by experiments with cats along the same line as the conditioned reflex experiments devised by the famous Russian physiologist, I. Pavlov.

"Three of the cats tested heard tones as high as 10,000 to 20,000 cycles per second," Dr. Wever reported.

Science News-Letter, April 19, 1930

Balloon Photographs Armageddon

Archæology—Aviation

Archaeologists Get Air Picture of Palestine Site

Air view taken with small meteorological observation balloon at a height of about 400 feet.

By Dr. Charles Breasted
Oriental Institute

AERIAL photography, as applied to archaeological field excavations in the Near East through the use of meteorological balloons equipped with cameras, has been introduced for the first time by the Megiddo Expedition of the Oriental Institute of the University of Chicago, now clearing the great Mound of ancient Armageddon in Palestine. P. L. O. Guy, field director of the expedition, who served as a machine gun officer in the Great War, has just reported his successful application of observation balloon photography to the recently excavated levels of Megiddo.

The success of his experiments holds great promise for the compilation of mosaic maps of this and other sites now being excavated by the Oriental Institute. Heretofore the greatest difficulty has been experienced in securing air views from airplanes because, in order to get proper detail, the planes must fly so low that their speed interferes with the camera's accuracy.

Mr. Guy employs a balloon capable of lifting about forty pounds, or considerably more than the weight of a home-made, light-weight, fixed-focus camera with film holder and ingenious release mechanism whereby the camera can be operated from the ground. The balloon is on very strong, thin piano wire and is raised and lowered by a winch which registers its height. Even with adverse wind conditions remarkable results have been obtained. The mosaic air-view plans already compiled cannot be distinguished from the best airplane photographs.

The use of these small balloons may be extended to the recording of areas suspected of containing archaeological ruins so long buried beneath the surface of the ground that even when light conditions are absolutely favorable they escape detection except from the air.

The entire surface of the Mound of Megiddo, comprising nearly 70,000 square yards, has now been cleared down to the age of Solomon, 970-932 B. C. Work is progressing rapidly, and it is expected that beneath the Solomonic level will be found evidence of ancient Egyptian domination, of the greatest significance and interest to historians.

Science News-Letter, April 19, 1930

Psychologists Offer Test Service

Psychology—Employment

A GROUP of well-known American psychologists have found a way for the working man and woman to put psychological tests to personal use.

This group, the Psychological Corporation, has arranged a testing service, whereby any one can take an assortment of tests of mental and other abilities and can obtain a certificate. The certificate, signed by an examiner accredited by the Corporation, shows the standing made by the individual in the different types of test. The job-seeker thus gains a new sort of credential to present when he or she enters an employment office in the business or factory world.

The Psychological Corporation has for president Dr. R. S. Woodworth, professor of psychology at Columbia University, and for chairman of the directors Dr. J. McKeen Cattell, president of the recent International Congress of Psychology, and editor of *Science*. Well-known psychologists connected with universities, laboratories, and clinics represent the corporation in its activities throughout the country. These scientists have now taken on the new project of giving vocational counsel, conducting tests of ability, and certifying to the demonstrated abilities of individuals, all with the idea of aiding individuals to find the place in industry and business where they will best fit, it was explained by Dr. Paul S. Achilles, secretary of the corporation. Fees for examining and counsel vary, Dr. Achilles said, but the corporation is not a money-making enterprise, and a portion of all fees received is invested in research.

Fading Away

Our whole universe seems to be fading away to a point where practically no matter will remain, and all space will be filled with radiation, travelling from nowhere to nowhere. The possibility of this state, in the far distant future, is indicated by calculations made by Dr. Louis S. Kassel, of the Gates Chemical Laboratory of the California Institute of Technology. The current issue of the *Physical Review* carries the technical details of his calculations.

Dr. Kassel bases his work on recent theories of P.A.M. Dirac, prominent English physicist, on the nature of the proton that makes up the inner part of the atoms of matter. According to these theories, the electrons, the other parts of the atom, can exist in certain states in which its mass is negative, or less than nothing. In such a state, according to Dr. Kassel's summary of the Dirac theory, the electron's energy is also negative, or less than none at all, and becomes still less the faster it moves. Dr. Kassel derives mathematically an equation which permits a "vanishingly small amount of matter."

"Our result may be regarded as in some measure supporting the view that if any matter is to be preserved in the final equilibrium of the universe it must be rescued by the tendency of matter toward aggregation," Dr. Kassell says. "But the evidence of astronomy suggests that the stars are constantly gaining matter in the form of dust and meteors, transforming it into radiation and sending it back into space; this may mean, of course, that the universe cannot save its matter by any device and that it is steadily fading away. On the other hand the evidence of the cosmic rays may be supposed to indicate that in the depths of space radiation is converted back into matter; if this process is occurring it can only mean that the foregoing calculation, and all others of a similar nature, are utterly incorrect."

Astronomy
Science News-Letter, April 19, 1930

Vitamin in Salmon Oil

Salmon oil, now looked upon as a fisheries by-product of no great value, is a good source of the rickets-preventing vitamin D, now considered essential for the raising of chicks and other young animals as well as for the proper rearing of children.

So the American Chemical Society learned at its recent meeting from E. M. Nelson of the U. S. Department of Agriculture and J. R. Manning, of the U. S. Department of Commerce. The two chemists tried out a number of oils from commercially handled fishes, and discovered that salmon oil, though not the most abundantly produced of these, is nearest to cod liver oil in its vitamin D concentration. As extracted by the present methods, which are not especially good from the vitamin standpoint, salmon oil is about equal in potency to the poorer medicinal grades of cod liver oil. Since the potential supply of salmon oil is five times as great as the present domestic supply of cod liver oil, these findings are regarded as significant.

Nutrition
Science News-Letter, April 19, 1930

Squeezability

Measurements of the speed of ultra-sound waves, vibrating 400,000 times a second, twenty times as fast as the shrillest audible sound, in various solutions of chemicals was described by three Johns Hopkins University chemists. Speaking before the section on physical and inorganic chemistry of the American Chemical Society, Drs. E. B. Freyer, J. C. Hubbard and D. H. Andrews told of their work with the sonic interferometer. From such measurements can be determined the compressibility, or "squeezability" of the liquid. The chemicals tested were solutions of chlorides, bromides and iodides of potassium and sodium, including common salt.

Physical Chemistry
Science News-Letter, April 19, 1930

Great Wall at Ur

Ur of the Chaldees, the place in which the patriarch Abraham spent his boyhood, was a town of canals and harbors, and round the city limits rose a great encircling wall, according to a report just received from C. Leonard Woolley, director of the Joint Archaeological Expedition of the University of Pennsylvania Museum and the British Museum to Mesopotamia.

For two and a half miles, the excavators have traced the remains of the wall which once defied the enemies of Ur. The wall was built by King Ur-Engur, who ruled about 2300 B. C., or about three centuries before Abraham's time.

The base is a rampart of mud brick, surmounted by a burnt brick wall. The defense rose 26 feet high and spread 70 to 90 feet in width. The front of the rampart sloped sharply down, and for much of its length was washed by the waters of a wide canal.

"One of the most surprising discoveries we have made is that the Ur of 2500 B. C. was a city of waters," Mr. Woolley states. "We found that it was almost entirely surrounded by water. The Euphrates ran to the west of it, canals along its north and eastern ends, and to all appearances a canal was dug right through the middle of the town close to the limits of the Sacred Area."

A large harbor enclosed by long walled moles reaching out from the rampart, and a smaller harbor inside the town wall, have been located.

Four temples, one built by Nebuchadnezzar, and two built earlier, in the days of Abraham, have been brought to light, Mr. Woolley reports. Two of the temples are now being excavated. One of the temples of Abraham's time was dedicated to the Water-God, and the other to a deity named Ningishzida, the brother of Adonis.

Archæology
Science News-Letter, April 19, 1930

Kava

"Ginger moon" paralysis, which has recently caused public health officials in some of the southern states a good deal of trouble, has an analogue in certain of the happy isles of the South Pacific. Only there the paralyzing effect of the local beverage is known and allowed for in advance, and its consequences are not so serious as they are in this country.

The natives of the islands of Western Polynesia, says Prof. W. J. G. Land of the University of Chicago, make a drink called "kava" out of the root of the shrub *Piper methysticum*, a member of the pepper family. Prof. Land had an opportunity to observe the peculiar effect of this potent variety of home brew some years ago, when he was on a botanical exploration trip in the South Pacific region.

The drink has two mutually opposing effects on its imbibers. When a man has taken a sufficient quantity of it, he becomes exceedingly quarrelsome, but at the same time he becomes completely paralyzed from

SCIENCE FIELDS

the waist down. He thus forms all sorts of hostile intentions, but is unable to move a step toward putting them into execution.

When the men of a village prepare for a kava drinking party, Prof. Land says, they seat themselves on the ground, leaning against the posts of one of their big circular huts. They maintain intervals that will just permit them, by stretching a bit, to pass a coconut shell full of the brew from hand to hand. The shell goes round, replenished at proper intervals by girls who do not drink any of it themselves.

The drinkers soon begin to grow intoxicated and quarrelsome. They curse each other, to the extent that the limited Polynesian vocabulary of impoliteness will permit, and utter dire threats of mayhem and murder. But their legs are helpless, so all the sound and fury signifies nothing. Presently the liquor finishes its work, and the drinkers topple over and fall asleep. By morning their legs and tempers are all right again, and everybody goes off amicably to try his luck at fishing.

Toxicology

Science News-Letter, April 19, 1930

Genghis Khan Destroyed It

Rich finds from an ancient city destroyed by the Mongol conqueror Genghis Khan have been made by Prof. B. P. Denike, of Museum of Oriental Culture, of Moscow. Prof. Denike has returned from an expedition which carried him southward through Soviet Central Asia as far as the northern border of Afghanistan.

Near this border he found the ruins of old tombs, and the high walls and fortifications of the city of Termeza, abandoned since the middle ages. A survey showed that the ruins spread over a large area of the barren, dead region. His excavations brought to light a large building decorated with fine carvings, which show the close relations between the art of Central Asia in the middle ages and the art of the Tigris and Euphrates valley. This supports the records of medieval travelers and geographers, who described the trade relations of these regions.

Three successive cities had stood on the site. The oldest was a Buddhist city, fragments of Buddhist statues and architectural ornaments showed. The upper part of a terracotta statue of Greek type was also found buried in this far-away Asiatic city.

The expedition is considered very successful in that it has revived knowledge of the former culture and art in this forgotten corner of Asia. The area explored was once a stopping place along the highway traveled by merchants from China and other parts of the East heading into western Asia and Europe.

Archæology

Science News-Letter, April 19, 1930

Bees' Mental Clocks

Bees don't carry wrist watches and they don't have any alarm clocks in their hives, but they are always on time for meals just the same. Not only that, but they quickly learn of changes in feeding-time and adjust their schedules accordingly.

The time sense of bees has been investigated by I. Beling of Berlin-Dahlem, who has reported his results to the scientific journal *Die Naturwissenschaften*. He set out saucers of sugar-water at a given hour of the day. In a couple of days the bees knew when to expect the "hand-out," and turned up on time, or even a little before time. They kept it up even when he stopped offering free food.

Then he changed the hour, and also increased the number of feedings to two, and in some experiments to three. The bees quickly learned the new schedule.

Comparative Psychology

Science News-Letter, April 19, 1930

Night Landing

An aviator coming to earth through a dark sky can see a landing field covered with whitewashed crushed stone 15 times as well as he can see one paved with asphalt, aviation lighting engineers of the General Electric Co. report. To light both fields equally well, 15 times as much light is required for the asphalt as for the rock.

Many surfaces have been tested and given a reflection factor. The stone reflects 75 per cent. of the light it receives and the asphalt reflects five. For Portland cement the figure is 30 per cent.; for crushed stone, 25; crushed slag, gravel and clay soil, 20; sandy soil, 10 to 12; cinders, five to 10; black soil, five to eight; and asphalt, five.

Aviation

Science News-Letter, April 19, 1930

Vitamin Overdoses

That there can be too much of a good thing has been demonstrated anew by a New York biochemist, R. F. Light, who spoke before the meeting of the American Chemical Society. He fed to experimental animals heavy overdoses of vitamin D, the substance that prevents rickets. In this overdosage it carried its preventive activities too far, making it impossible for the animals to reproduce their species after the second generation.

Other studies in vitamin overdosing were carried out by Mr. Light in collaboration with G. E. Miller and C. N. Frey. In these it was found, among other things, that too much vitamin D produces a condition resembling pellagra, which could be delayed, though not prevented, by the administration of vitamin G, the pellagra preventive vitamin.

Nutrition

Science News-Letter, April 19, 1930

Electric Eye

An electric eye, sensitive to color changes too minute for the human eye to detect, now watches chemical analyses, allowing the weary scientist to relax from the strained attention he once had to bestow on a tube of fluid in order to catch the fleeting hue that told him what was going on in its world of invisible ions and molecules.

Many chemical analyses depend on color changes to tell of their progress. The old familiar blue-litmus test was a crude example. The modern method consists of putting a tube or cell of the fluid to be watched between a light and a photoelectric cell. The latter is a tube or bulb lined with potassium or some other metal, and it is so constructed as to give off a minute electric current when light strikes it at a sufficient intensity.

The color in the fluid to be tested may be too dense at first for the light to strike through and reach the photoelectric cell. But as the reaction proceeds the color fades. At just the critical point the light strikes through, touches the sensitive lining of the photoelectric cell, and the resulting current notifies the waiting chemist by ringing a bell, lighting a lamp, or in some other way. Or it may merely be used to cause an electric pen to make a line on a sheet of recording paper, thus registering the result of the experiment while the chemist is fast asleep at home or taking a bridge lesson from his wife, instead of burning the midnight oil in his laboratory.

Physical Chemistry

Science News-Letter, April 19, 1930

Spinal Curvature Blamed On Muscles

Physiology

Reports from Anatomists and Physical Anthropologists

LACK of balance between the set of muscles on one side of the spine and those on the opposite side was described as the cause of spinal curvature by Dr. Eben J. Carey of Marquette University Medical School, Milwaukee, at the meeting this week of the American Association of Anatomists.

This suggestion contradicts a prevalent theory of the cause of this rather common condition in which the spinal column curves somewhat to one side or the other, generally accompanied by round shoulders and hollow or sway back. The usual theory is that the curvature is due to the motionless dead load of the body's weight on the upright spinal column.

In most animals the spine is horizontal and does not bear the full weight of the body. Yet Dr. Carey was able to produce typical spinal curvature in such animals by weakening muscles on one side of the spine, while leaving those on the other side unchanged.

According to Dr. Carey's theory, the weight of the body in human beings is supported directly by symmetrically balanced muscles on both sides of the spine, and indirectly by the spinal column itself.

When the muscles are weak or of poor tone, so that the muscle pull is unequal on the growing spine of a child, curvature results.

In preventing curvature, therefore, one must guard against such conditions as bad posture of the body, lack of sunlight, lack of a balanced diet, lack of moderate muscle exercise, lack of adequate rest in a horizontal position, lack of sufficient fresh air, and chronic foci of infection, all of which might produce muscle weakness or poor musclar tone.

Science News-Letter, April 19, 1930

Hearing

THE present theories of hearing have been upset by an anatomical discovery reported by Dr. Stacy R. Guild of the Otological Research Laboratory, Johns Hopkins University. In this Baltimore laboratory earnest investigations are being made in the hope of learning more about the causes of deafness and, subsequently, methods of preventing or relieving this affliction.

A rare type of structural defect of the inner ear was found in one ear of a man who, four weeks before his death, had perfectly normal hearing with even slightly better than average hearing for low tones, Dr. Guild reported.

The condition found was a large opening in the bony partition between two turns of the spiral tube of the inner ear. According to some of the best known current theories, sound waves pass up one side of this tube and down the other on their way to stimulate the nerve of hearing. If these theories are correct, the large opening found in this tube should have interfered with the wave systems in such a way as to have seriously interfered with hearing, Dr. Guild pointed out. The theoretical effect of such an abnormal opening may be compared to the effect in theaters or auditoriums where, due to echoes, there are "silent spots" or "confusion spots."

Science News-Letter, April 19, 1930

World's Tallest

OLD Virginians whose ancestors were the Cavaliers and Roundheads who settled the first English colony in America, have been studied by an anatomist who finds that they are among the tallest people in the world.

Physical measurements were made of over 6,000 old Virginians of both sexes between the ages of 6 and 60 years by Prof. Robert Bennet Bean of the University of Virginia. The families of most of these people had been among the first settlers, the famous first families of Virginia, and all of them had been residents of Virginia for two generations or more.

"The stature and leg length of the men and women are greater than for the majority of European peoples," Prof. Bean reported to the American Association of Physical Anthropologists.

The persons measured were divided into groups. The tallest were the men of the group of planters, or gentlemen farmers, from Albemarle county, whose average height was approximately 5 feet, 11 inches. Next tallest were the group of men students between the ages of 17 and 20.

The others from Albemarle county also had a tall stature. These people may represent the descendants of pioneers from the Tidewater section of Virginia and such families as those of Jefferson, Marshall and Washington, who were all tall men, Prof. Bean pointed out. The city dwellers had a smaller stature than the others.

Science News-Letter, April 19, 1930

Difference in Faces

THE different expressions seen on the faces of members of different races is partly due to the fact that the muscles of the face are different in different races, Dr. Ernst Huber, associate professor of anatomy at the Johns Hopkins University, reported.

Dr. Huber has made anatomical studies of a large series of American Negroes of all ages and compared them with whites, with an adult Chinese and with an adult Hawaiian. He also analyzed the facial expression in various human races.

"Racial characteristics are more conspicuous in the facial musculature than in the rest of the muscle system, where differences are likewise recognizable," he said.

While differences in the facial expressions of different races are due to differences in the muscles, skin and tissues beneath the skin of the face, they are even more the result of characteristic racial differences in mental and emotional reactions, Dr. Huber said.

Science News-Letter, April 19, 1930

Girls' Size Unchanged

MEASUREMENTS of nearly 17,000 women students at the University of Minnesota did not confirm the theory that the average girl's physique has become more slender through dieting or other means during recent years, says Dr. C. M. Jackson of the Institute of Anatomy at the University of Minnesota.

The young women were measured upon entering the university in the years from 1912 to 1929. There was a decrease of four months in the average age during this period, but this would not be enough to affect the stature (*Continued on page* 254)

NATURE RAMBLINGS

By Frank Thone

Flowering Dogwood

If someone were to start a straw vote to find out what flowering bush is most popular in this country, it is highly likely that the flowering dogwood would score very high. It might easily capture first place, but for the regrettable fact that it is unknown in the prairie and plains regions of the West. In the East and South, however, where it grows abundantly, it is immensely popular, and on the Pacific coast, where there is a different but similar-appearing species, it is again a favorite.

If anything, the flowering dogwood is too much of a favorite. We all of us have the weakness of desiring to possess whatever pleases us greatly, and thousands of motorists yearly raid the dogwood thickets within reach of the road, stripping them of flowering branches and effectively ruining the shrubs. In many communities persons who are interested in keeping our native flora alive put on annual spring drives to "Spare the dogwood!" They are usually effective, too; for the sin that besets most of us is just thoughtlessness rather than greed or lack of consideration, and we are ready to respond if properly appealed to. So there is a fair hope that if the good work is kept up, the flowering dogwood will survive even along the roadsides.

Where the dogwood got its name is more or less of a riddle. There is nothing about it suggesting a dog. However, it is conjectured that it is a variant of an archaic word, "dagwood"; a "dag" being a skewer of hard wood used in dressing meat in the kitchen. Europe has no flowering dogwood, but less showy members of the genus are widespread, and the dogwood got its name long before our beautiful shrub was known to white men.

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"Thus have I briefly explained the probabilities and defects of those subtle contrivances, whereby the making of a perpetuall motion hath been attempted. I would be loath to discourage the enquiry of any ingenuous artificer, by denying the possibility of effecting it with any of these Mechanicall helps; But yet (I conceive) if those principles which concern the slownesse of the power in comparison to the greatness of the weight, were rightly understood, and thoroughly considered, they would make this experiment to seem (if not altogether impossible, yet) much more difficult then otherwise perhaps it will appear. However, the inquiring after it, cannot but deserve our endeavours, as being one of the most noble amongst al these Mechanical subtilties. And (as it is in the fable of him who dugge the Vineyard, for a hid treasure, though he did not finde the money, yet hee thereby made the ground more fruitfull, so) though we doe not attaine to the effecting of this particular, yet our searching after it may discover so many other excellent subtilties, as shall abundantly recompense the labour of our enquiry.

And then besides, it may be another encouragement to consider the pleasure of such speculations, which doe ravish and sublime the thoughts with more cleare angelicall contentments. . . . The justice of providence having so contrived it, that the pleasure which there is in the successe of such inventions, should be proportioned to the great difficulty and labour of their inquiry."—Wilkins

THAT which I shall mention as the last way, for the triall of this experiment, is by contriving it in some water instrument; which may seem altogether as probable and safe as any of the rest, because that element by reason of its fluid and subtle nature (whereby of its own acord it searhes out the lower and more narrow passages) may be most pliable to the mind of the artificer. Now the usuall means for the ascent of water is either by *Suckers* or *Forces*, or something equivalent thereunto; Neither of which may be conveniently applied unto such a work as this, because there is required unto each of them so much or more strength, as may be answerable to the full weight of the water that is to be drawn up; and then besides, they move for the most part by fits and snatches, so that it is not easily conceivable, how they should conduce unto such a motion, which by reason of its perpetuity must bee regular and equall.

But amongst all other ways to this purpose, that invention of *Archimedes* is incomparably the best, which is usually called *Cochlea*, or the *water-screw*, being framed by the helicall revolution of a cavity about a Cylinder. We have not any discourse from the Authour himself concerning it, nor is it certain whether he ever writ any thing to this purpose. But if he did, yet as the injury of time hath deprived us of many other his excellent workes, so likewise of this, amongst the rest . . .

The nature and manner of making this, is more largely handled by *Vitruvius*.

The figure of it is after this manner.

When you see there is a Cylinder *AA*, and a spirall cavity or pipe twining about it, according to equall revolutions *BB*. The axis and centers of its motions are at the points *CD*, upon which being turned, it will so happen that the same part of the pipe which was now lowermost, will presently become higher, so that the water does ascend by descending; ascending in comparison to the whole instrument, and descending in respect of its severall parts. This being one of the strangest wonders amongst those many, wherein these Mathematicall arts doe abound, that a heavy body should rise by falling down, and the farther it passes by its own naturall motion of descent, by so much higher still shall it ascend; which though it seems so evidently to contradict all reason and Philosophy; yet in this instrument it may be manifested both by demonstration and sense.

This pipe or cavity for the matter of it, cannot easily be made of metall, by reason of its often turnings; but for triall, there might bee such a cavity, cut in a columne of wood, and afterwards covered over with tinne plate.

For the form and manner of making this screw, *Vitruvius* does prescribe these two rules:

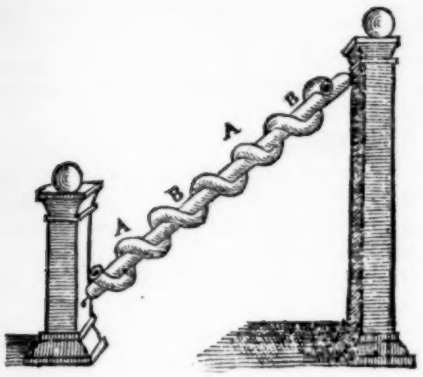
1. That there must be an equality observed betwixt the breadth of the pipe, and the distance of its severall circumvolutions,

2. That there must be such a proportion betwixt the length of the instrument, and its elevation, as is answerable to the *Pythagoricall Trigon*. If the Hypotenusall, or Screw be 5, the perpendicular or elevation must be 3, and the basis 4.

However (with his leave) neither of these proportions are generally necessary, but should be varied according to other circumstances. As for the breadth of the pipe in respect of its revolutions, it is left at liberty, and may bee contrived according to the quantity of water which it should contain. The chief thing to be considered is the obliquity or closenesse of these circumvolutions. For the nearer they are unto one another, the higher may the instrument be erected; there being no other guide for its true elevation but this . . .

If you would know the just quantity of water which every revolution does contain and carry, according to any inclination of the cylinder, this may be easily found by ascribing on it an *Ellipsis*, parallel to the Horizon; which *Ellipsis* will shew how much of the revolution is empty, and how much full.

The true inclination of the Screw being found, together with the certain quantity of water which every *helix* does contain; it is further considerable, that the water by this instrument does ascend naturally of itself without any violence or labour, and that the heaviness of it does lie chiefly upon the centers or axis of the cylinder, both its sides being of equall weight (saith *Vbaldus;*) So that (it should seem) though we suppose each revolution to have an equall quantity of water, yet the Screw will remain with any part upwards (according as it shall be set) without turning itself either way. And therefore the least strength being added to either of its sides, should make it descend, according to that common maxime of *Archimedes;* any addition will make that which equiponderates with another, to tend downwards.



Archimedes' Cochlea or water-screw described by Vitruvius. With some such device Archimedes is said to have bailed out the ships. In use, the screw was turned by hand to lift the water.

But now, because the weight of this instrument, and the water in it does leane wholly upon the axis, hence is it (saith *Vbaldus*) that the grating and rubbing of these axes against the sockets wherein they are placed, will cause some ineptitude and resistency to that rotation of the cylinder, which would otherwise ensue upon the addition of the least weight to any one side; But (saith the same Authour) any power that is greater than this resistency which does arise from the axis, will serve for the turning of it round.

THESE things considered together, it will hence appear, how a perpetual motion may seem easily contrivable. For if there were but such a water-wheel made on this instrument, upon which the stream that is carried up, may fall in its descent, it would turn the Screw round, and by that means convey as much water up, as is required to move it, so that the motion must needs be continuall, since the same weight which in its fall does turn the wheel, is by the turning of the wheel carried up again.

Or if the water falling upon one wheel would not be forcible enough for this effect, why then there might be two or three, or more, according as the length and elevation of the instrument will admit; By which means the weight of it may bee so multiplied in the fall, that it shall be equivalent to twice or thrice that quantity of water which ascends. As may be more plainly discerned by this following Diagram.

Where the figure *L M*, at the bottome does represent a wooden cylinder with helicall cavities cut in it, which at *A B*, is supposed to be covered over with tin plates, and three water-wheels upon it *H I K*. The lower cistern which contains the water being *C D*. Now this cylinder being turned round, all the water which from the cistern ascends through it, will fall into the vessell at *E*, and from that vessell being conveyed upon the water-wheel *H*, shall consequently give a circular motion to the whole Screw: Or if this alone should bee too weak for the turning of it, then the same water which falls from wheel *H*, being received into the other vessell *F*, may from thence again descend on the wheel *I*; by which means the force of it will be doubled. And if this be yet insufficient, then may the water which falls on the second wheel *I*, be received into the other vessell *G*, and from thence again descend on the third wheel at *K*: and so for as many other wheeles, as the instrument is capable of. So that besides the greater distance of these three streams from the center or axis, by which they are made so much heavier, and besides, that the fall of this outward water is forcible and violent, whereas the ascent of that within is naturall; Besides all this, there is thrice as much water to turn the Screw, as is carried up by it.

But on the other side, if all the water falling upon one wheel, would be able to turn it round, then half of it would serve with two wheels; and the rest may be so disposed of in the fall, as to serve unto some other usefull delightfull ends.

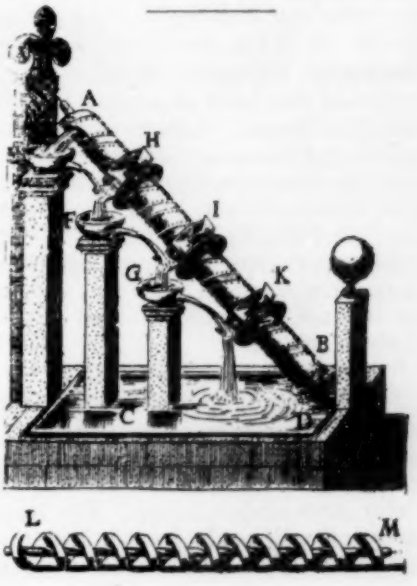
When I first thought of this invention, I could scarce forbear with *Archimedes* to cry out *"Eureka, eureka"*; It seeming so infallible a way for the effecting of a perpetuall motion, that nothing could bee so much as probably objected against it: But upon triall and experience I finde it altogether insufficient for any such purpose, and that for these two reasons:

1. The water that ascends will not make any considerable stream in the fall.

2. This stream (though multiplied) will not bee of force enough to turn about the Screw.

1. The water ascends gently and by intermissions, but it falls continuately and with force; each of the three vessels being supposed full at the first, that so the weight of the water in them might adde the greater strength and swiftness to the streams that descend from them; Now this swiftnesse of motion will cause so great a difference betwixt them, that one of these little streams may spend more water in the fall, then a stream six times bigger in the ascent, though we should suppose both of them to be continuate; How much more then, when as the ascending water is vented by fits and intermissions, every circumvolution voiding onely so much as is contained in one *Helix?* And in this particular, one that is not versed in these kinds of experiments, may bee easily deceived.

But secondly, though there were so great a disproportion, yet notwithstanding the force of these outward streams, migh well enough serve for the turning of the Screw, if it were so that both its sides would equiponderate the water being in them (as *Vbaldus* hath affirmed). But now upon farther examination, we shall find this assertion of his, to be utterly against both reason and experience. And herein does consist the chief mistake of this contrivance. For the ascending side of the Screw is made by the water contained in it so much heavier then the descending side, that these outward streams thus applied, will not be of force enough to make them equiponderate, much less to move the whole.



The perpetual motion machine which Wilkins proposed to build on the principle of Archimedes' water-screw. Water falling from the cups was to turn the screw, which was to raise water to refill the cups. He hoped to have a little power left over.

Idols of the Bible Land—*Continued*

orgies. It was she against whom the prophets of the Bible most ardently raged, for her cult made its appeal through the most primitive and deep-rooted passions of the race. Women who desired children, men and maidens who would be happily wed, as well as those who were allured by the licentious rites, all craved the protection of the goddess of love.

The layer of ruins at Kirjath-Sepher which contained the five figurines of Astarte stood as a living city in the days of Joshua about 1200 B. C. This was the town that Othniel besieged to win Achsah for his wife. Deep layers of ashes tell a story of a terrible fire. From that time on, Kirjath-Sepher was no longer a Caananite royal city, but a Hebrew provincial town.

When the victorious Israelites took possession, Othniel, the conqueror, rebuilt the city and became the first of the judges of Israel. From the state of the ruins, archaeologists conclude that Othniel built hastily. The walls show signs of rapid, none too expert, workmanship. Othniel's followers were not the experienced builders of fortresses that the Canaanites were. The men that he set to work as brickmakers, masons, and carpenters had been wandering in the wilderness. The knowledge of building that the Israelites acquired in the land of the Pharaohs had become almost tradition.

These Israelites came into Canaan just about the time when iron was introduced there. Contrasting the last of the Canaanite cities at Kirjath-Sepher with the city built by Othniel, Dr. M. G. Kyle, president of Xenia Theological Seminary, stated:

"Below this layer of ashes a careful examination of the pieces of pottery showed that it was all Canaanite. Likewise the implements and the weapons were Canaanite and made of bronze. No iron whatever appeared. Evidently up to that layer of ashes the Canaanites occupied the city and as yet did not use iron, at least extensively, if at all.

"Above the layer of ashes a very different state of things was revealed; every bit of pottery was Israelite!—unmistakably Israelite. Besides, all the weapons and the tools were also Israelite, and made of iron. The more beautiful and costly bronze had disappeared. Never again did we find a piece of bronze in the city, except one arrowhead. This was almost certainly shot into the city by an enemy from without, and so did not represent Israelite weapons."

The Israelites got their iron, it is believed, from the Philistines, who immigrated into Canaan from across the Mediterranean, and probably brought knowledge of iron into the land for the first time. For a while, the Philistines controlled the iron trade. But, Dr. Kyle explains, "when smelting furnaces made iron abundant and cheap, it quickly drove out the expensive bronze as the automobile drove out the horse from our civilization within twenty-five years." This happened about the thirteenth century B.C., just the age of the Israelite conquest.

This fifth edition of Kirjath-Sepher, like the others before it, was eventually laid in ruins, and for the last time a town rose on the top of the heap. This was a crowded, busy little community, as the closely built houses show. It had some 5,000 inhabitants and was a center of a dyeing and weaving industry. Four dye plants with stone vats are among its ruins. This last Kirjath-Sepher belonged to the days of the divided Israelites, when the south of Palestine was the Kingdom of Judah, and the north was the Kingdom of Israel. From the tenth century B. C. to the sixth, Kirjath-Sepher flourished, and then was suddenly demolished forever by the Chaldean army of Nebuchadnezzar which swept the Israelites down to Babylon, to captivity.

Out of the debris of this last of the hilltop towns, archaeologists have taken a variety of everyday objects used by the Hebrews of the period of the Kings of Israel and Judah. There are the iron tools of laborers, the household pottery, and the toys, rattles, and whistles of the children. The whistles were promptly blown by the excavators who found them, and the little clay toys sent out the same shrill pipe that amused the children of the city in Biblical times.

Out of this layer, too, were taken cosmetic palettes of the women's dressing rooms, with traces of green and black pigments for lining the eyes, still clinging to stone containers. And again, the figures of the popular and persistent goddess Astarte, bobbed-haired and boldly unclad. These figurines—idols the prophets called them—were symbols of divinity about the time that Isaiah and Jeremiah so bitterly lamented that their people's vision of an unseen Almighty had become so dim.

The names of a Biblical king and his servant have been preserved in this city. The handle of a broken jar lay among the ruins, and on the handle was impressed a seal inscribed: "Belonging to Eliakim, servant of Joiakin."

This Joiakin, or Jehoiachin, was the boy king who reigned in Jerusalem for only a few months, and was overthrown by Nebuchadnezzer, all in the year 597 B. C. The jar handle must have been stamped with its proud seal of ownership in that year. This means that Kirjath-Sepher was then in existence. Whether it fell before the Chaldeans then, or whether it stood until about ten years later when the Hebrews were swept away into captivity, is yet to be learned. Nor is it yet discovered why that sixth city on the hill was the last of Kirjath-Sepher.

Science News-Letter, April 19, 1930

Physiology—*Continued*

although it might reduce the average weight, Dr. Jackson explained.

The average stature increased one-tenth of an inch during this period, but the average weight not including clothing showed a corresponding increase of about two and one-half pounds.

However, measurements at Hollins College in Virginia during the period from 1920 to 1927 showed about half an inch increase in the average stature with a decrease of about three and one-half pounds in the average weight. These figures give a large proportion of apparent underweights.

That a general improvement in average stature began at a still earlier period is indicated by the combined data, totalling 21,383 women, for Stanford University and Smith and Vassar Colleges. These figures showed a progressive increase in stature amounting to about one and two-tenths inches during the thirty years from 1890 to 1920. The Vassar data show also a corresponding gain of 7 or 8 pounds in weight, although there was little change in weight during the last ten years of the period.

Science News-Letter, April 19, 1930

FIRST GLANCES AT NEW BOOKS

SALVAGING OLD AGE — Lillien J. Martin and Clare de Gruchy—*Macmillan,* 173 pp., $2. "The tragedy of old age is its unhappiness," declare the authors of this wise little book. Dr. Martin, who is seventy-eight, has met her own problem by conducting a clinic for old people since her retirement from Stanford University. She has studied this period of life, just as other specialists have studied childhood or adolescence. The psychological problems, particularly the mental hygiene, of growing old happily and usefully are stressed by the authors.

Psychology
Science News-Letter, April 19, 1930

ACES OF THE AIR — Joseph L. French—*McLoughlin Bros.,* 316 pp., $1. Magazine articles on aviation exploits during the past two years have been assembled to form this volume.

Aviation
Science News-Letter, April 19, 1930

AN HOUR OF PHYSICS—E. N. da C. Andrade—*Lippincott,* 160 pp., $1. A new addition to the rapidly growing library of popular works on physics, in which a prominent English scientific writer tells what he can about the quantum theory, radiation, atomic structure, etc., without the aid of mathematics. The lack of an index is a serious defect.

Physics
Science News-Letter, April 19, 1930

THE GRASSES OF CENTRAL AMERICA—A. S. Hitchcock—*U. S. Government Printing Office,* 205 pp., 35c. Prof. Hitchcock here continues the excellent work by which he has been making American botanists generally, and agronomists in particular, lastingly his debtors.

Botany
Science News-Letter, March 29, 1930

THE HEREDISCOPE—O. F. Cooke—*American Genetic Association* $3. This is not a book, but it will be more useful than many books in the teaching of the mysteries of mendelism to the younger student. It is a kind of game board, with colored counters to represent unit characters, a teetotum to assume the role of the Gods of Biological Chance, and a diagram to trace the movement of chromosomes from generation to generation. It turns the dry and abstract discussion of heredity.

Genetics
Science News-Letter, April 19, 1930

ALL ABOUT PETS—Margery Bianco—*Macmillan,* 134 pp., $2. Dogs and cats, rabbits, mice and guinea pigs, canaries and goldfish—how to select them, train them and care for them, and by what means you can best develop their several capacities for friendship.

Animal Husbandry
Science News-Letter, April 19, 1930

AERONAUTICAL LAW—W. Jefferson Davis—*Parker, Stone & Baird Co.* 541 pp., $10. Now that it is the subject of an imposing legal volume, aviation must really be convinced that it is growing up. The same author also recently brought together in a similar way the laws and cases relating to radio.

Aviation Law
Science News-Letter, April 19, 1930

THE FORAMINIFERA OF THE ATLANTIC OCEAN, PART 7—J. A. Cushman—*U. S. Government Printing Office,* 129 pp., 35c. Comprises the Nonionidae, Camerinidae, Peneroplidae and Alveolinellidae.

Zoology
Science News-Letter, April 19, 1930

MAGNETISM—Edmund C. Stoner—*Dutton,* 177 pp., $1.10. In this series of monographs on physical subjects, edited in England, one finds in small compass many excellent summaries of the latest knowledge on important topics. This book on magnetism is fully up to the high standards of the series and, though quite technical, will be of value to readers with the necessary preparation.

Physics
Science News-Letter, April 19, 1930

STANDARDS YEARBOOK 1930 — Bureau of Standards—*Government Printing Office,* 401 pp., 75c. Standardization provides a common language for the products of modern industry. The National Bureau of Standards cooperating like other federal departments and commercial organizations is America's leader in achieving helpful and beneficial uniformity of products and conditions of testing products. This latest edition summarizes the activities of trade associations as well as projects of national and international scope.

Standardization
Science News-Letter, April 19, 1930

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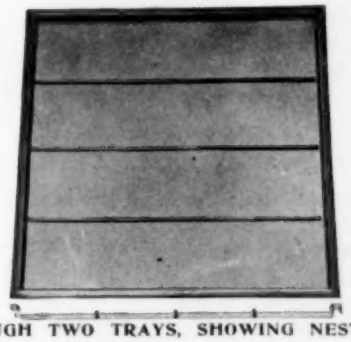

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First Glances at New Books—*Continued*

ENCYCLOPAEDIA OF THE SOCIAL SCIENCES. Vol. I Aar-All—Editor-in-Chief, Edwin R. A. Seligman—*Macmillan,* 646 pp., $7.50. Those who become interested in any of the sciences that deal with society and its institutions soon realize that all these sciences are closely inter-dependent. The case of a single delinquent may be a problem of law, economics, sociology, education, psychiatry. To provide an authoritative reference work on the social aspects of science, this combination dictionary and handbook is being published. The work is sponsored by ten learned societies of this country. It is designed partly for the scholar who may wish reference information on social sciences allied to his own specialty; also for the intelligent layman who is keeping abreast of recent investigation. Three volumes of the work will appear each year, and there will be fifteen in all. A large portion of this first volume is given to introductory articles on the development of social thought and institutions and on the social sciences in various countries.

Social Science
Science News-Letter, April 19, 1930

EVERYBODY'S GARDEN — Frank A. Waugh—*Orange Judd,* 396 pp., $3.50. A book for home gardeners, no matter what size their gardens. It gives counsel on what to plant and where and how, on how to take care of shrubs and herbs and trees; it comments on taste and administers gentle reproof here and there for the shortcomings we Americans have not yet overcome. All round, a desirable book.

Horticulture
Science News-Letter, April 19, 1930

WEIGHTS AND MEASURES REFERENCES—*U. S. Government Printing Office,* 26 pp., 10c. Volumes have been written about weights and measures. This miscellaneous publication No. 103 of the U. S. Bureau of Standards is a bibliography of "published material relating to the subject of weights and measures standards and administration."

Standards
Science News-Letter, April 19, 1930

ELEMENTARY SCIENCE BY GRADES: BOOK ONE — Ellis C. Persing and Elizabeth K. Peeples—*Appleton,* 128 pp., 72c. The beginnings of knowledge in nature study, astronomy, physics and so on, in words of very few syllables for budding scientists of very few birthdays.

General Science
Science News-Letter, April 19, 1930

RIDING THE AIR WAVES WITH ERIC PALMER, JR.—*Horace Liveright,* 329 pp., $2. This is the story of a "ham," one of the thousands of amateur radio operators who talk in code and by voice to all the corners of the globe through the medium of their own radio stations. Like many amateur radio operators, the author is a mere youth in age. After you have read his story you will be tempted to make a corner for yourself in the ether.

Radio
Science News-Letter, April 19, 1930

JUMP—Don Glassman—*Simon and Schuster,* 321 pp., $3. The thrill of the forced parachute jump from a disabled airplane is that of a good old-fashioned shipwreck enhanced by the speed and appeal of a new mode of transportation. Anyone who saves his life through a parachute jump from a disabled aircraft automatically joins the caterpillar club, an informal organization of over 200. "Jump" is the story of their initiation.

Aviation
Science News-Letter, April 19, 1930

A SHORT HISTORY OF CHINESE CIVILIZATION—Richard Wilhelm—*Viking Press,* 284 pp., $4. A convenient and interesting survey of China's cultural development by a German professor who has spent many years in China and has made that country his specialty. Prof. Wilhelm sums up his book admirably in the preface, where he states his aim to be: "no tedious enumeration of dates, wars, and sovereigns, but as clear an account as possible of the forces responsible for the various periods of Chinese civilization and culture, making the treatment of each subject more or less detailed in accordance with its cultural significance." The history ends with the coming of Europeans into China. The translation is by Joan Joshua.

History
Science News-Letter, April 19, 1930

THE GALL WASP GENUS CYNIPS—Alfred C. Kinsey—*Indiana University* 577 pp., $2.50. Besides being a thorough-going monograph covering the taxonomic aspects of a difficult insect group, this book is a study in the origin of species. Often the intensive study of the morphology and distribution of a limited group of organisms will suggest solutions not to be found in a wider but more superficial survey of the world of living things.

Entomology—Evolution
Science News-Letter, April 19, 1930

THE PARIS GUN—Henry W. Miller—*Jonathan Cape and Harrison Smith* 288 pp., $3.75. In presenting this collation of all obtainable facts about the long-range guns (for there were really seven of them in all) that shelled Paris during the spring and early summer of 1918, Col. Miller functions excellently in a three-fold capacity. He is a soldier, and specifically an officer of ordnance, in his close and meticulous attention to technical detail. He is a historian in showing the planned relation of the bombardment of Paris to the great German "peace offensive" of 1918. Finally, he is a most successful science popularizer, for his presentation is vivid and easily understandable, giving the essential facts without swamping the reader in technical language.

Military History
Science News-Letter, April 19, 1930

THE BURGESS SEASHORE BOOK FOR CHILDREN—Thornton W. Burgess—*Little, Brown,* 336 pp., $3. A book of seashore lore for children, written in the "animal-talking" style which Burgess has made so popular. The illustrations, though clear and accurate, seem rather too technical to fit properly with the text.

Children's Stories
Science News-Letter, April 19, 1930

ETHNOLOGY OF AFRICA — Wilfred D. Hambly—*Field Museum of Natural History,* 268 pp., $1.50. This thick little paper-back book is written as a guide for use of visitors and students who may tarry with special interest in the African hall of the Field Museum. The book, however, is complete enough in itself without reference to the exhibits to make satisfactory reading about the native tribes of Africa, their appearance, culture, and problems.

Ethnology
Science News-Letter, April 19, 1930

THE ROYAL INSCRIPTIONS OF SUMER AND AKKAD—George A. Barton—*Yale University Press,* 406 pp., $6.50. Royal inscriptions are among the great treasures recovered from Kish, Ur, and other ruined cities of ancient Babylonia. The discoveries have not yet been sufficient to enable scholars to build into history a complete sequence of kings and their careers, but this important volume brings together the large number of texts and their translations now available. The volume is the first of a series entitled "Library of Ancient Semitic Inscriptions" published for the American Oriental Society.

History—Philology
Science News-Letter, April 19, 1930